OTHER ROCKFISH

by

Rebecca F. Reuter and Paul D. Spencer

CHANGES FROM LAST YEAR'S ASSESSMENT

Relative to last year's final BS/AI SAFE Report, the following substantive changes have been made in the current draft of the Other Rockfish chapter:

(1) The 1999 landings have been revised and the 2000 landings through October 14, 2000 have been included in the assessment.

(2) A summary of the 2001 ABC's and OFL's relative to the 2000 recommendations is as follows:

		Eastern Bering Sea		Aleutian Islands	
		Last Year	This Year	Last Year	This Year
Other Rockfish	ABC	369 t	361 t	685 t	676 t
	OFL	492 t	482 t	913 t	901 t

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INTRODUCTION

Other rockfish, which includes all species of *Sebastes* and *Sebastolobus* spp. other than the Pacific ocean perch complex (Pacific ocean perch. *S. alutus*; northern rockfish, *S. polyspinis*; rougheye rockfish, *S. aleutianus*; shortraker rockfish, *S. borealis*; and sharpchin rockfish, *S. zacentrus*) have traditionally been managed as a unit and have been grouped together in reported commercial catch statistics. Since 1977, however, species of rockfish have been identified in catches by U.S. observers, which have provided a means of estimating annual harvests of individual species. Over 27 species of "other rockfish" have been confirmed or tentatively identified in catches from the eastern Bering Sea and Aleutian Islands region (Table 1). Shortspine thornyheads (*Sebastolobus alascanus*), however, account for the bulk of the other rockfish catch. Additionally, in recent trawl surveys from the Aleutian Islands, over 90% of the other rockfish biomass is comprised of shortspine thornyheads.

For management purposes, the other rockfish resource is assumed to consist of two separate stocks and are therefore assessed and managed as two major groups -- the eastern Bering Sea (EBS) group and the Aleutian Islands group.

CATCH HISTORY

Historical catches of other rockfish since implementation of the MFCMA are shown in Table 2. Catches prior to 1990 are assumed to include discards; whereas, catches during the period 1990-2000 explicitly account for discards based on NMFS Regional Office and observer information. The peak catch of other rockfish in the EBS occurred in 1978 with a removal of 2,600 t. In the Aleutian region, peak catch occurred in 1979 with a harvest of 4,500 t.

The catches of the main species of other rockfish by area and year are shown in Table 3. These catches were extrapolated from samples taken by fishery observers (Note: this is not the total harvest for this group). These tables show that in both the Aleutian Islands (AI) and eastern Bering Sea (EBS), light dusky rockfish and shortspine thornyheads make up the bulk of the other rockfish catch. Most notable is the proportion of light dusky rockfish catch in the AI which ranges from 46% to 61% and 8% to 43% in the EBS. Almost 80% of the 1999 total harvest of light dusky rockfish in the AI was taken as bycatch in the Atka mackerel bottom trawl fishery (Table 4). Within the AI, the eastern AI (management area 541) has the highest catch of light dusky rockfish (66% of total light dusky rockfish catch in AI, whereas in the EBS the 1999 light dusky rockfish harvest was spread out among the following fisheries; the Pollock trawl fisheries, the Pacific cod trawl fishery and the Atka mackerel trawl fishery. Additionally, about 43% of the 1999 shortspine thornyhead harvest (in the EBS) was caught as bycatch in the Greenland Turbot longline fishery (Table 4). It is important to note that none of the species in this group have been studied extensively. Thus, further analyses of historical data need to be conducted, as well as, field research to collect specific data that is not routinely collected on research surveys or by fishery observers.

ASSESSMENT METHODS

Relative Abundance

Commercial catch and effort data are of little use in examining trends in abundance for other rockfish. Since this group is primarily bycatch in other directed fisheries, standardization of commercial effort data is complex, particularly given the current multispecies management practices. For shortspine thornyheads, however, an index of abundance can be provided from data from the longline survey conducted by the Auke Bay Lab (Ianelli and Gaichas 1999) and future analysis should be performed to determine the feasibility of incorporating those data into this assessment.

Absolute Abundance

A number of past trawl surveys provide estimates of exploitable biomass for the EBS and AI regions. The 1979-86 cooperative U.S.-Japan trawl surveys in the EBS were conducted both on the continental shelf and slope, but almost all catches of other rockfish were taken by Japanese research trawlers working the difficult to fish slope regions at depths exceeding 200 m. For this reason, only data collected by Japanese research vessels were employed to calculate other rockfish abundance estimates for those years. In 1991 trawl surveys were conducted in both the EBS and Aleutian regions. These surveys, however, were conducted entirely by domestic trawlers and did not include participation by the deeper-water Japanese research trawlers. The most recent trawl surveys occurred in 1991,1994, 1997 and 2000 in the Aleutian Islands region, and biomass for these surveys was re-estimated in 2000 with more accurate area estimates of the survey's strata. Although a slope survey of the EBS was conducted in 2000 the biomass results will not be available for this year's stock assessment.

ABUNDANCE AND EXPLOITATION TRENDS

Biomass estimates for other rockfish were produced from cooperative U.S.-Japan trawl surveys from 1979-1985 on the eastern Bering Sea slope, and from 1980-1986 in the Aleutian Islands. U.S domestic trawl surveys were conducted in 1988 and 1991 on the eastern Bering Sea slope, and in 1991,1994, 1997, and 2000 in the Aleutian Islands (Table 5). The biomass for the EBS group of other rockfish is comprised of 2 components--the EBS shelf-slope component and the Aleutian component of Bering Sea area 1 (Table 5).

The variances of the point estimates were large, making it almost impossible to determine any statistically significant changes in biomass from one survey year to the next (Table 5). The large change in biomass estimates from the 1979-1986 to the 1991-2000 surveys are probably due to the differences in vessel type and survey methodology. It appears, though, that the biomass estimates from each group of surveys are consistent. Regional biomass differences, from past surveys, between the AI and EBS suggests that the amount of essential habitat for these species of rockfish is greater along the slope area of the AI. With this information we thought it prudent to take an average of all the survey point estimates to arrive at a recent biomass for this group of species in each region.

Recent survey data indicate that shortspine thornyhead, light dusky rockfish and harlequin rockfish make up the bulk of the survey catches of other rockfish. The most recent survey estimates indicate that ~ 90% of the other rockfish biomass is comprised of shortspine thornyhead (Table 6). The proportion of light dusky rockfish in the survey estimates is considerably lower than those in the catch estimates from the fishery. This discrepancy suggests that the distribution of effort by the fishery is different than that of the

survey. Future studies should further analyze why the species composition and abundance of survey catches are different than those for the fishery.

Based upon available information, the "best" estimate of exploitable biomass for other rockfish is 6,884 t in the EBS and 12,875 t in the Aleutian Islands.

REFERENCE FISHING MORTALITY RATES AND YIELDS

Information is lacking to calculate reference fishing mortality rates and yields that directly conserve spawning stock biomass. We therefore employ a proxy F=M strategy to determine ABC. The value of M (0.07), represents an approximation based on knowledge of rockfish life histories from other areas. This value is based on the estimate for shortspine thornyheads (Ianelli and Ito 1994) since this species evidently comprises well over 90% of the other rockfish biomass (as calculated by survey data).

Under tier 5 of Amendment 44, a fishing mortality rate equal to 75% of the natural mortality rate is the maximum allowable F (ABC) value. Therefore, the estimate of ABC for the eastern Bering Sea region is 361 t (0.75 x 0.07 x 6,884) and 676 t (0.75 x 0.07 x 12,875) for the Aleutian Islands region.

Based on the overfishing definition, the overfishing level (OFL) is computed assuming $F_{OFL} = M$. Thus, the overfishing level for the eastern Bering Sea region is 482 t and 901 t for the Aleutian Islands region.

SUMMARY

A summary of the estimates of current exploitable biomass and ABC for the other rockfish group in the EBS and Aleutian Islands region is provided in the following table:

Region	Exploitable biomass (t)	ABC (t)	OFL (t)
Eastern Bering Sea	6,884	361	482
Aleutian Islands Region	12,875	676	901

REFERENCES

Ianelli, J. N., and D. H. Ito. 1994. Status of the thornyhead (*Sebastolobus sp*.) resource in 1994. *In:* Stock assessment and fishery evaluation report of the Gulf of Alaska as projected for 1995 (November 1994), 26 pp. North Pacific Fishery Management Council, P.O. Box 103136, Anchorage, AK 99510.

Ianelli, J.N., and S. Gaichas. 1999. Thornyheads. *In:* Stock assessment and fishery evaluation report for the groundfish resources of the Gulf of Alaska as projected for 2000. Nov. 1999. North Pacific Fishery Management Council, P.O Box 103136, Anchorage, AK 99510.

Table 1. The common and scientific names of rockfish in the "other rockfish" reporting category identified by U.S. observers in the eastern Bering Sea and Aleutian Islands regions.

Aurora rockfish	*Sebastes aurora*
Black rockfish	*Sebastes melanops*
Blackgill rockfish	*Sebastes melanostomus*
Blue rockfish	*Sebastes mystinus*
Bocaccio	*Sebastes paucispinis*
Canary rockfish	*Sebastes pinniger*
Chilipepper rockfish	*Sebastes goodei*
Copper rockfish	*Sebastes caurinus*
Dark blotched rockfish	*Sebastes crameri*
Dark dusky rockfish	*Sebastes ciliatus*
Greenstriped rockfish	*Sebastes elongatus*
Harlequin rockfish	*Sebastes variegatus*
Pygmy rockfish	*Sebastes wilsoni*
Red banded rockfish	*Sebastes babcocki*
Redstripe rockfish	*Sebastes proriger*
Rosethorn rockfish	*Sebastes helvomaculatus*
Silvergray rockfish	*Sebastes brevispinis*
Splitnose rockfish	*Sebastes diploproa*
Stripetail rockfish	*Sebastes saxicola*
Tiger rockfish	*Sebastes nigrocinctus*
Vermilion rockfish	*Sebastes miniatus*
Widow rockfish	*Sebastes entomelas*
Yelloweye rockfish (rasphead)	*Sebastes ruberrimus*
Yellowmouth rockfish	*Sebastes reedi*
Yellowtail rockfish	*Sebastes flavidus*
Longspine thornyhead rockfish	*Sebastolobus altivelis*
Shortspine thornyhead rockfish	*Sebastolobus alascanus*

Table 2.--Summary of catches (t) of other rockfish in the eastern Bering Sea and Aleutian Islands regions. Source: NMFS/AK regional website.

	Eastern Bering Sea				Aleutian Islands			
		Domestic				Domestic		
Year	Foreign	JVP	DAP	Total	Foreign	JVP	DAP	Total
1977	311	--	--	311	3,043	--	--	3,043
1978	2,614	--	--	2,614	921	--	--	921
1979	2,108	--	--	2,108	4,517	--	--	4,517
1980	456	3	--	459	420	--	--	420
1981	331	--	25	356	328	--	--	328
1982	262	11	3	276	2,114	--	--	2,114
1983	212	8	--	220	1,041	4	--	1,045
1984	121	8	47	176	42	14	--	56
1985	33	3	56	92	2	14	83	99
1986	4	12	86	102	Tr	15	154	169
1987	3	4	467	474	0	6	141	147
1988	0	8	333	341	0	68	210	278
1989	0	4	188	192	0	0	481	481
1990	0	0	418	418	0	0	858	858
1991	0	0	422	422	0	0	343	343
1992	0	0	600	600	0	0	664	664
1993	0	0	192	192	0	0	496	496
1994	0	0	133	133	0	0	292	292
1995	0	0	288	288	0	0	219	219
1996	0	0	170	170	0	0	282	282
1997	0	0	163	163	0	0	305	305
1998	0	0	188	188	0	0	364	364
1999	0	0	135	135	0	0	631	631
2000(1)	0	0	270	270	0	0	542	542

(1) Estimated removals through October 14, 2000.

Table 3. Observed fishery catch (t) of top species in other rockfish group in the Aleutian Islands and eastern Bering Sea from 1996-2000.
Source: North Pacific Observer Database AFSC Seattle WA.

Aleutian Islands

2000*	E	C	W	Total
Light Dusky	171	59	4	**234**
Shortspine	41	20	19	**80**
Rockfish unid.	6	24	2	**32**
Harlequin	12	13	2	**26**
Redstripe	<1	<1	8	**9**
Total	**230**	**116**	**35**	**381**

1999	E	C	W	Total
Light Dusky	158	27	7	**191**
Rockfish unid.	105	13	2	**120**
Shortspine	24	21	16	**61**
Redstripe	<1	18	29	**47**
Harlequin	2	6	13	**21**
Thorny unid.	8	9	3	**20**
Dark Dusky	5	9	3	**17**
Total	**302**	**103**	**73**	**477**

1998	E	C	W	Total
Light Dusky	84	20	3	**107**
Shortspine	28	21	6	**55**
Rockfish unid.	6	0	31	**37**
Harlequin	1	11	7	**19**
Small red Rockfish group	0	0	10	**10**
Redstripe	0	8	0	**8**
Total	**119**	**60**	**57**	**236**

1997	E	C	W	Total
Shortspine	24	15	35	**74**
Light Dusky	60	11	2	**73**
Harlequin	<1	4	5	**9**
Rockfish unid.	3	<1	0	**3**
Total	**87**	**30**	**42**	**159**

1996	E	C	W	Total
Light Dusky	44	32	4	**80**
Shortspine	28	19	22	**69**
Thorny unid.	2	1	4	**7**
Harlequin	0	2	3	**5**
Dark blotched	0	4	<1	**4**
Total	**74**	**58**	**33**	**165**

Eastern Bering Sea

2000*	No. Bering Sea	So. Bering Sea (517-519)	Total
Shortspine thornyhead	13	65	**78**
Redstripe	<1	73	**73**
Light Dusky	4	10	**14**
Rockfish unid.	10	2	**12**
Longspine thornyhead	4	1	**4**
Total	**31**	**151**	**181**

1999	No. Bering Sea	So. Bering Sea (517-519)	Total
Shortspine thornyhead	10	28	**38**
Light Dusky	2	16	**18**
Rockfish unid.	3	3	**6**
Small Red Rockfish Group	<1	3	**3**
Thornyhead unid.	1	3	**4**
Total	**16**	**53**	**69**

1998	No. Bering Sea	So. Bering Sea (517-519)	Total
Shortspine thornyhead	19	44	**63**
Light Dusky	14	18	**32**
Rockfish unid.	1	2	**3**
Black	5	<1	**5**
Thornyhead unid.	1	2	**3**
Total	**40**	**66**	**106**

1997	No. Bering Sea	So. Bering Sea (517-519)	Total
Shortspine thornyhead	11	45	**56**
Light Dusky	5	12	**17**
Redstripe	2	<1	**2**
Rockfish unid.	1	1	**2**
Thornyhead unid.	0	2	**2**
Total	**19**	**60**	**79**

1996	No. Bering Sea	So. Bering Sea (517-519)	Total
Shortspine thornyhead	9	31	**40**
Light Dusky	6	24	**30**
Total	**15**	**55**	**70**

* Observed catch through October 14th 2000

Table 4. Catch of Light dusky rockfish and Shortspine thornyhead by fishery and gear type for 1999. Source: NorPac Database AFSC Seattle WA.

Aleutian Islands

Light dusky rockfish

	Geartype			
Target fishery	**Trawl**	**Pot**	**Longline**	**Total**
Atka mackerel	148626			**148626**
P. Cod	21781	272	11410	**33463**
Northern	3390			**3390**
POP	5061			**5061**
Total	**178858**	**272**	**11410**	**190539**

Shortspine thornyhead

	Geartype			
Target fishery	**Trawl**	**Pot**	**Longline**	**Total**
Other fish*		54	29591	**29645**
POP	17631			**17631**
Sablefish		20	8146	**8166**
Greenland Turbot		12	2960	**2972**
Total	**17631**	**85**	**40697**	**58413**

Eastern Bering Sea

Light dusky rockfish

	Gear type			
Target fishery	**Trawl**	**Pot**	**Longline**	**Total**
Atka mackerel	5899			**5899**
Pollock	5352			**5352**
Cod	1094	308	3009	**4411**
Northern	654			**654**
POP	475			**475**
Total	**13474**	**308**	**3009**	**16791**

Shortspine thornyhead

	Gear type			
Target fishery	**Trawl**	**Pot**	**Longline**	**Total**
Greenland Turbot	3720	18	13046	**16785**
Arrowtooth/ Kamchatka	8674	7	1098	**9778**
Other fish*	58	0	8733	**8791**
Sablefish	27	41	973	**1041**
Total	**12480**	**66**	**23850**	**36396**

*Other fish target made up mainly of grenadiers and/or skates

Table 5. Estimated biomass (t) of “other rockfish” from the NMFS bottom trawl surveys.

	Eastern Bering Sea (EBS)		
	EBS shelf/slope	Aleutians portion of EBS Area 1	Aleutian Region
1979	3,251	--	--
1980	--	1,095	19,078
1981	4,975	--	--
1982	4,381	--	--
1983	--	1,696	15,995
1984	--	--	--
1985	5,127	--	--
1986	--	5,187	20,336
1987	--	--	--
1988	8,759	--	--
1989	--	--	--
1990	--	--	--
1991	4,529	246	7,654
1992	--	--	--
1993	--	--	--
1994	--	1,171	6,449
1995	--	--	–
1996	--	--	--
1997	--	1,683	9,539
1998	--	--	--
1999	--	--	--
2000	–-*	922	11,072

*Biomass estimates from the 2000 EBS slope survey will not be available until 2001.

Table 6. Biomass estimates (t) of the main species from the other rockfish group caught during the most recent Aleutian Islands surveys; by species, year and management area.

2000	**E**	**C**	**W**	**Southern BS**	**total BSAI**
Shortspine thornyheads	522	3,815	5,476	876	**10,689**
Light Dusky	468	579	186	46	**1,279**
Harlequin	8	15	3	0	**26**
Total	**AI**	**11,072**	**SBS**	**922**	**11,994**

1997	**E**	**C**	**W**	**Southern BS**	**total BSAI**
Shortspine thornyheads	159	2,011	6,726	1,545	**10,441**
Light Dusky	442	78	54	138	**712**
Harlequin	5	53	10	0	**68**
Total	**AI**	**9,538**	**SBS**	**1,683**	**11,221**

1994	**E**	**C**	**W**	**Southern BS**	**total BSAI**
Shortspine thornyheads	187	1,554	4,499	1,071	**7,311**
Light Dusky	7	52	132	99	**290**
Harlequin	5	12	1	2	**20**
Total	**AI**	**6,449**	**SBS**	**1,172**	**7,621**

1991	**E**	**C**	**W**	**Southern BS**	**total BSAI**
Shortspine thornyheads	118	1,815	5,143	187	**7,264**
Light Dusky	127	417	12	58	**614**
Harlequin	2	15	4	0	**21**
Total	**AI**	**7,654**	**SBS**	**245**	**7,899**